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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/593,352	06/14/2000	Douglas W. Raymond	TER-012PUS	8371

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TERADYNE, INC  
321 HARRISON AVE  
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EXAMINER
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WONG, ALLEN C

ART UNIT	PAPER NUMBER
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2613

DATE MAILED: 05/14/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/593,352

Applicant(s)

RAYMOND ET AL.

Examiner

Allen Wong

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,3-13 and 15-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-13 and 15-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to claims 1, 12, 17 and 23 have been read and considered but are moot in view of the new ground(s) of rejection.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 12 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wasserman (5,260,779) in view of Magro (6,260,081).

Regarding claims 12 and 15, Wasserman discloses an optical inspection system for inspecting an object, comprising:

a plurality of cameras for imaging the object (see col.3, ln.43-47 and fig.2, note plural cameras 13-16 are used to inspect circuit board);

an illumination system for providing a plurality of lighting modes to illuminate the object for the plurality of cameras (fig.1, element 20 is a lighting fixture used for illuminating the object, circuit board);

a main computer coupled to the plurality of cameras and the illumination system (fig.2, element 30 is a main computer);

a frame grabber unit for receiving image data from the plurality of cameras, wherein the frame grabber unit includes at least one image acquisition board having a

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plurality of channels for transmitting image data from at least two of the plurality of cameras concurrently to main memory, which is directly accessible by the main computer (fig.2, note the images obtained by cameras 13-16 have respective outputs 21-24, and that these image outputs 21-24 are sent to frame storage units 25-28, functioning to be the main memory, where main computer 30 can access these images stored in the frame storage units 25-28 for viewing).

Wasserman discloses the use of multiple cameras with multiple storage units corresponding to each camera (fig.2). Although Wasserman does not specifically disclose wherein each of the plurality of channels correspond to a DMA channel, however, Magro teaches the use of a DMA controller with a plurality of DMA channels that can be accessed (see fig.2 and col.4, ln.61 to col.5, ln.65; peripherals such as cameras and other devices can be accessed by connecting to a DMA controller through plural DMA channels). Therefore, it would have been obvious to one of ordinary skill in the art to take the teachings of Wasserman and Magro, as a whole, for freeing up the computer processor to execute and perform other tasks so as to speed up the overall computer operation (Magro col.3, ln.1-7).

Regarding claim 16, Wasserman discloses the object is a circuit board (col.3, ln.43-47).

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wasserman (5,260,779) and Magro (6,260,081) as applied to claim 12 above, and further in view of Buckley (6,064,759).

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With regards to claim 13, Wasserman discloses the imaging of the object with various lighting modes (see fig.1 and col.3, ln.43-47; note the cameras 13-16 work in conjunction with illumination means 20, where multiple light modes can occur, so that appropriate images can be obtained by cameras 13-16). Wasserman and Magro are silent about the capturing of data associated with the plurality of lighting modes in a single pass. However, Buckley teaches the capturing of image data associated with the plurality of lighting modes in a single pass (see fig.5 and col.4, ln.36-38 and col.14, ln.58-67, Buckley discloses that there can be multiple light sources, or lighting modes, that can be applied all in one single pass to capture the image data of the object or item to be inspected). Therefore, it would have been obvious to one of ordinary skill in the art to take the teachings of Wasserman, Magro and Buckley, as a whole, for accurately capturing all of the necessary image data for analysis in a fast, expedient manner (Buckley col.3, ln.30-35).

1. Claims 1, 9-10, 17-18 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wuyts (EP 0772381 A1) and Wasserman (5,260,779) in view of Buckley (6,064,759).

Regarding claim 23, Wuyts discloses a method of manufacturing a circuit board, comprising:

fabricating a printed circuit board (col.1, ln.3-6; a circuit board is made);

populating the circuit board with components (col.1, ln.3-6; components are inserted into circuit board);

soldering the components to the circuit board to provide a circuit board assembly (col.1, ln.3-6; components are "press-fit" or soldered onto the circuit board);

inspecting the circuit board assembly by selecting a speed for movement of a head assembly supporting a camera with respect to the circuit board (fig.2, the inspection head 20 has a camera 80, and the head 20 moves at a certain speed, so a speed is selected for moving the head).

Wuyts discloses the use of asynchronous camera (col.4, ln.26-29; Wuyts discloses the asynchronous camera 70 is not connected to head 20).

Wuyts does not specifically disclose the use of plural cameras connected to a head assembly; dividing the circuit board into field of views, each of which includes a plurality of firing positions; for each of the plurality of firing positions, selecting at least one of a plurality of asynchronously triggerable cameras and a first one of a plurality of lighting modes, wherein a first location on the circuit board can be imaged by a first one of the plurality of cameras in second and third ones of the plurality of lighting modes; and transmitting image data from the plurality of cameras to memory.

However, Wasserman teaches the use of plural cameras connected to a head assembly (fig.1, element 11 is a head assembly that has plural cameras 13-16); dividing the circuit board into field of views, each of which includes a plurality of firing positions (see fig.1-2 and col.3, ln.43-47; the cameras 13-16 can be positioned to obtain multiple field of views); for each of the plurality of firing positions, selecting at least one of a plurality of triggerable cameras and a first one of a plurality of lighting modes, wherein a first location on the circuit board can be imaged by a first one of the plurality of cameras

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in second and third ones of the plurality of lighting modes (see fig.1 and col.3, ln.43-47; note the cameras 13-16 work in conjunction with illumination means 20, where multiple light modes can occur, so that appropriate images can be obtained by cameras 13-16); and transmitting image data from the plurality of cameras to memory (fig.2, note the images obtained by cameras 13-16 have respective outputs 21-24, and that these image outputs 21-24 are transmitted to frame storage units 25-28, functioning to be the main memory, where main computer 30 can access these images stored in the frame storage units 25-28 for processing and viewing).

Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Wuyts and Wasserman as a whole for permitting accurate, efficient, precise inspection of the printed circuit boards. Doing so would improve the printed circuit board inspection efficiency and save costs.

Wuyts and Wasserman do not specifically disclose the capturing of data associated with the plurality of lighting modes in a single pass. However, Buckley teaches the capturing of image data associated with the plurality of lighting modes in a single pass (see fig.5 and col.4, ln.36-38 and col.14, ln.58-67, Buckley discloses that there can be multiple light sources, or lighting modes, that can be applied all in one single pass to capture the image data of the object or item to be inspected). Therefore, it would have been obvious to one of ordinary skill in the art to take the teachings of Wuyts, Wasserman and Buckley, as a whole, for accurately capturing all of the necessary image data for analysis in a fast, expedient manner (Buckley col.3, ln.30-35).

Note claims 1, 9-10, 17-18 and 22 have similar corresponding elements.

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2. Claims 3-4, 7-8, 11 and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wuyts, Wasserman and Buckley as applied to claims 1 and 17 above, and further in view of Magro (6,260,081).

Regarding claims 3-4, 7-8, 11 and 19-21, Wuyts does not disclose the plural channels are concurrently sent to the memory, where the memory data can be accessed directly by the main computer. However, Wasserman discloses the plural channels are concurrently sent to the memory, where the memory data can be accessed directly by the main computer (fig.2, note the images obtained by cameras 13-16 have respective outputs 21-24, and that these image outputs 21-24 are concurrently sent to frame storage units 25-28, functioning to be the main memory, where main computer 30 can directly access these images stored in the frame storage units 25-28 for processing and viewing). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Wuyts and Wasserman as a whole for permitting accurate, efficient, precise inspection of the printed circuit boards. Doing so would improve the printed circuit board inspection efficiency and save costs.

Although Wuyts, Wasserman and Buckley do not specifically disclose wherein each of the plurality of channels correspond to a DMA channel, however, Magro teaches the use of a DMA controller with a plurality of DMA channels that can be accessed (see fig.2 and col.4, ln.61 to col.5, ln.65; peripherals such as cameras and other devices can be accessed by connecting to a DMA controller through plural DMA channels). Therefore, it would have been obvious to one of ordinary skill in the art to take the teachings of Wuyts, Wasserman, Buckley and Magro, as a whole, for freeing

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up the computer processor to execute and perform other tasks so as to speed up the overall computer operation (Magro col.3, ln.1-7).

Regarding claim 5, Wuyts does not disclose there are at least four cameras. However, Wasserman discloses there are at least four cameras (fig.2, elements 13-16). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teachings of Wuyts and Wasserman as a whole for permitting accurate, efficient, precise inspection of the printed circuit boards. Doing so would improve the printed circuit board inspection efficiency and save costs.

Regarding claim 6, Wuyts discloses the object is a circuit board (col.1, ln.3-6).

#### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen Wong whose telephone number is (703) 306-5978. The examiner can normally be reached on Mondays to Thursdays from 8am-6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christopher Kelley can be reached on (703) 305-4856. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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Business Center (EBC) at 866-217-9197 (toll-free).



Allen Wong  
Examiner  
Art Unit 2613

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